Hardware Installation Guide

NXA-ENET24

24-Port Fast Ethernet Switch

Control System Accessories

Last Revised: 11/15/2006

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Compliances

FCC - Class A

This equipment generates, uses, and can radiate radio frequency energy and, if not installed and used in accordance with the instruction manual, may cause interference to radio communications. It has been tested and found to comply with the limits for a Class A computing device pursuant to Subpart B of Part 15 of FCC Rules, which are designed to provide reasonable protection against such interference when operated in a commercial environment. Operation of this equipment in a residential area is likely to cause interference, in which case the user, at his own expense, will be required to take whatever measures may be required to correct the interference. You are cautioned that changes or modifications not expressly approved by the party responsible for compliance could void your authority to operate the equipment.

You may use unshielded twisted-pair (UTP) for RJ-45 connections - Category 3 or greater for 10 Mbps connections, and Category 5 for 100 Mbps connections, and Category 5 or 5e for 1000 Mbps connections. For fiber optic connections, you may use 50/125 or 62.5/125 micron multimode fiber or 9/125 micron single-mode fiber.

Wear an anti-static wrist strap or take other suitable measures to prevent electrostatic discharge when handling this equipment.
When connecting this switch to a power outlet, connect the field ground lead on the tri-pole power plug to a valid earth ground line to prevent electrical hazards.

Industry Canada - Class A

This digital apparatus does not exceed the Class A limits for radio noise emissions from digital apparatus as set out in the interference-causing equipment standard entitled “Digital Apparatus,” ICES-003 of the Department of Communications.

Cet appareil numérique respecte les limites de bruits radioélectriques applicables aux appareils numériques de Classe A prescrites dans la norme sur le matériel brouilleur: “Appareils Numériques,” NMB-003 édictée par le ministère des Communications.

Japan VCCI Class A

この装置は、情報処理装置等電波障害自主規制協議会（ＶＣＣＩ）の基準に基づくクラスＡ情報技術装置です。この装置を家庭環境で使用すると電波妨害を引き起こすことがあります。この場合には使用者が適切な対策を講ずるよう要求されることがあります。

CE Mark Declaration of Conformance for EMI and Safety (EEC)

This information technology equipment complies with the requirements of the Council Directive 89/336/EEC on the Approximation of the laws of the Member States relating to Electromagnetic Compatibility and 73/23/EEC for electrical equipment used within certain voltage limits and the Amendment Directive 93/68/EEC. For the evaluation of the compliance with these Directives, the following standards were applied:

RFI Emission:
- Limit class A according to EN 55022:1998
- Limit class A for harmonic current emission according to EN 61000-3-2/1995
- Limitation of voltage fluctuation and flicker in low-voltage supply system according to EN 61000-3-3/1995

Immunity:
- Product family standard according to EN 55024:1998
- Electrostatic Discharge according to EN 61000-4-2:1995 (Contact Discharge: ±4 kV, Air Discharge: ±8 kV)
- Radio-frequency electromagnetic field according to EN 61000-4-3:1996 (80 - 1000 MHz with 1 kHz AM 80% Modulation: 3 V/m)
- Electrical fast transient/burst according to EN 61000-4-4:1995 (AC/DC power supply: ±1 kV, Data/Signal lines: ±0.5 kV)
- Surge immunity test according to EN 61000-4-5:1995 (AC/DC Line to Line: ±1 kV, AC/DC Line to Earth: ±2 kV)
- Immunity to conducted disturbances, Induced by radio-frequency fields: EN 61000-4-6:1996 (0.15 - 80 MHz with 1 kHz AM 80% Modulation: 3 V/m)
- Power frequency magnetic field immunity test according to EN 61000-4-8:1993 (1 A/m at frequency 50 Hz)
- Voltage dips, short interruptions and voltage variations immunity test according to EN 61000-4-11:1994 (>95% Reduction @10 ms, 30% Reduction @500 ms, >95% Reduction @5000 ms)

LVD:
- EN 60950 (A1/1992; A2/1993; A3/1993; A4/1995; A11/1997)

Do not plug a phone jack connector in the RJ-45 port. This may damage this device.
Les raccordeurs ne sont pas utilisé pour le système téléphonique!

Taiwan BSMI Class A

警告使用者：這是甲類的資訊產品，在居住的環境中使用時，可能會造成射頻干擾，在這種情況下，使用者會被要求採取某些適當的對策。

AS/NZS 3548 (1995) Class A

ACN 066 352 010

Safety Compliance

Warning: Fiber Optic Port Safety

When using a fiber optic port, never look at the transmit laser while it is powered on. Also, never look directly at the fiber TX port and fiber cable ends when they are powered on.

Avertissment: Ports pour fibres optiques - sécurité sur le plan optique

Ne regardez jamais le laser tant qu'il est sous tension. Ne regardez jamais directement le port TX (Transmission) à fibres optiques et les embouts de câbles à fibres optiques tant qu'ils sont sous tension.

Warnhinweis: Faseroptikanschlüsse - Optische Sicherheit

Niemals ein Übertragungslaser betrachten, während dieses eingeschaltet ist. Niemals direkt auf den Faser-TX-Anschluß und auf die Faserkabelenden schauen, während diese eingeschaltet sind.

Please read the following safety information carefully before installing the switch:

WARNING: Installation and removal of the unit must be carried out by qualified personnel only.

The unit must be connected to an earthed (grounded) outlet to comply with international safety standards.

Do not connect the unit to an A.C. outlet (power supply) without an earth (ground) connection.

The appliance coupler (the connector to the unit and not the wall plug) must have a configuration for mating with an EN 60320/IEC 320 appliance inlet.

The socket outlet must be near to the unit and easily accessible. You can only remove power from the unit by disconnecting the power cord from the outlet.

This unit operates under SELV (Safety Extra Low Voltage) conditions according to IEC 60950. The conditions are only maintained if the equipment to which it is connected also operates under SELV conditions.

France and Peru only
This unit cannot be powered from IT† supplies. If your supplies are of IT type, this unit must be powered by 230 V (2P+T) via an isolation transformer ratio 1:1, with the secondary connection point labelled Neutral, connected directly to earth (ground).

† Impédance à la terre

Power Cord Set	
U.S.A. and Canada	The cord set must be UL-approved and CSA certified.
	The minimum specifications for the flexible cord are: • No. 18 AWG - not longer than 2 meters, or 16 AWG. • Type SV or SJ • 3-conductor
	The cord set must have a rated current capacity of at least 10 A
	The attachment plug must be an earth-grounding type with NEMA 5-15P (15 A, 125 V) or NEMA 6-15P (15 A, 250 V) configuration.
Denmark	The supply plug must comply with Section 107-2-D1, Standard DK2-1a or DK2-5a.
Switzerland	The supply plug must comply with SEV/ASE 1011.
U.K.	The supply plug must comply with BS1363 (3-pin 13 A) and be fitted with a 5 A fuse which complies with BS1362.
	The mains cord must be <HAR> or <BASEC> marked and be of type HO3VVF3GO.75 (minimum).
Europe	The supply plug must comply with CEE7/7 (“SCHUKO”).
	The mains cord must be <HAR> or <BASEC> marked and be of type HO3VVF3GO.75 (minimum).
	IEC-320 receptacle.

Veuillez lire à fond l'information de la sécurité suivante avant d'installer le Switch:

AVERTISSEMENT: L’installation et la dépose de ce groupe doivent être confiés à un personnel qualifié.

- Ne branchez pas votre appareil sur une prise secteur (alimentation électrique) lorsqu'il n'y a pas de connexion de mise à la terre (mise à la masse).
- Vous devez raccorder ce groupe à une sortie mise à la terre (mise à la masse) afin de respecter les normes internationales de sécurité.
- Le coupleur d’appareil (le connecteur du groupe et non pas la prise murale) doit respecter une configuration qui permet un branchement sur une entrée d’appareil EN 60320/IEC 320.
- La prise secteur doit se trouver à proximité de l’appareil et son accès doit être facile. Vous ne pouvez mettre l’appareil hors circuit qu’en débranchant son cordon électrique au niveau de cette prise.
- L’appareil fonctionne à une tension extrêmement basse de sécurité qui est conforme à la norme IEC 60950. Ces conditions ne sont maintenues que si l’équipement auquel il est raccordé fonctionne dans les mêmes conditions.

France et Pérou uniquement:

Ce groupe ne peut pas être alimenté par un dispositif à impédance à la terre. Si vos alimentations sont du type impédance à la terre, ce groupe doit être alimenté par une tension de 230 V (2 P+T) par le biais d’un transformateur d’isolement à rapport 1:1, avec un point secondaire de connexion portant l’appellation Neutre et avec raccordement direct à la terre (masse).

Cordon électrique - Il doit être agréé dans le pays d'utilisation	
Etats-Unis et Canada:	Le cordon doit avoir reçu l'homologation des UL et un certificat de la CSA.
	Les spe'cifications minimales pour un cable flexible sont AWG No. 18, ouAWG No. 16 pour un cable de longueur infe'rieure a` 2 me'tres. • type SV ou SJ • 3 conducteurs
	Le cordon doit être en mesure d'acheminer un courant nominal d'au moins 10 A.
	La prise femelle de branchement doit être du type à mise à la terre (mise à la masse) et respecter la configuration NEMA 5-15P (15 A, 125 V) ou NEMA 6-15P (15 A, 250 V).
Danemark:	La prise mâle d'alimentation doit respecter la section 107-2 D1 de la norme DK2 1a ou DK2 5a.
Suisse:	La prise mâle d'alimentation doit respecter la norme SEV/ASE 1011.
Europe	La prise secteur doit être conforme aux normes CEE 7/7 ("SCHUKO") LE cordon secteur doit porter la mention <HAR> ou <BASEC> et doit être de type HO3VVF3GO.75 (minimum).

Bitte unbedingt vor dem Einbauen des Switches die folgenden Sicherheitsanweisungen durchlesen:

WARNUNG: Die Installation und der Ausbau des Geräts darf nur durch Fachpersonal erfolgen.

- Das Gerät sollte nicht an eine ungeerdete Wechselstromsteckdose angeschlossen werden.
- Das Gerät muß an eine geerdete Steckdose angeschlossen werden, welche die internationalen Sicherheitsnormen erfüllt.
- Der Gerätestecker (der Anschluß an das Gerät, nicht der Wandsteckdosenstecker) muß einen gemäß EN 60320/IEC 320 konfigurierten Geräteeingang haben.
- Die Netzsteckdose muß in der Nähe des Geräts und leicht zugänglich sein. Die Stromversorgung des Geräts kann nur durch Herausziehen des Gerätenetzkabels aus der Netzsteckdose unterbrochen werden.
- Der Betrieb dieses Geräts erfolgt unter den SELV-Bedingungen (Sicherheitskleinstspannung) gemäß IEC 60950. Diese Bedingungen sind nur gegeben, wenn auch die an das Gerät angeschlossenen Geräte unter SELV-Bedingungen betrieben werden.

Stromkabel. Dies muss von dem Land, in dem es benutzt wird geprüft werden:	
Schweiz	Dieser Stromstecker muß die SEV/ASE 1011Bestimmungen einhalten.
Europe	Das Netzkabel muß vom Typ HO3VVF3GO.75 (Mindestanforderung) sein und die Aufschrift <HAR> oder <BASEC> tragen. Der Netzstecker muß die Norm CEE 7/7 erfüllen ("SCHUKO").

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Introduction

Overview

The 24-Port Fast Ethernet PoE Switch contains 24 10BASE-T/100BASE-TX RJ-45 ports and two combination ports—10/100/1000BASE-T ports that operate in combination with Small Form Factor Pluggable (SFP) transceiver slots.

All the 10BASE-T/100BASE-TX ports on this switch support IEEE 802.3af standard Power-over-Ethernet capabilities. Each port can detect connected 802.3af-compliant network devices, such as AMX's NXA-WAP 200 G, other third party's wireless access points or IP phones, and automatically supply the required DC power.

As well as its Power-over-Ethernet capabilities, the switch provides comprehensive network management features, and is specifically designed to provide reliability and consistant performance for audio/video streams coming from AMX's MAX units.

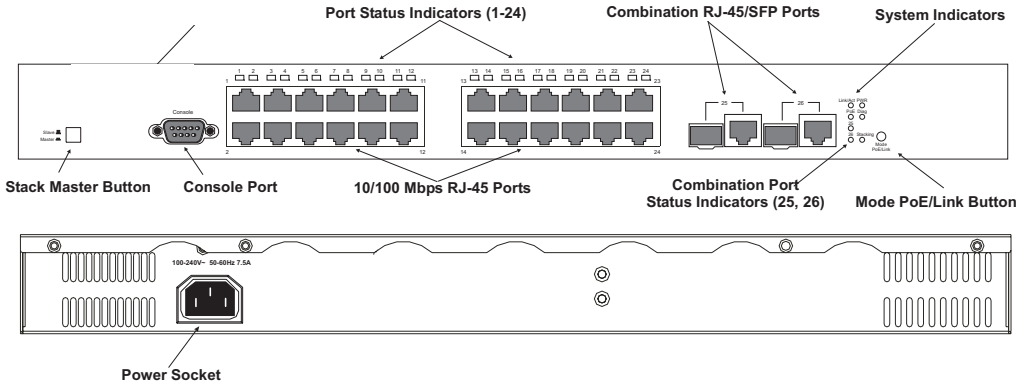

FIG. 1 Front and Rear Panels

Switch Architecture

The switch employs a wire-speed, non-blocking switching fabric. This permits simultaneous wire-speed transport of multiple packets at low latency on all ports. The switch also features full-duplex capability on all ports, which effectively doubles the bandwidth of each connection.

The PoE switch uses store-and-forward switching to ensure maximum data integrity. With store-and-forward switching, the entire packet must be received into a buffer and checked for validity before being forwarded. This prevents errors from being propagated throughout the network.

This switch includes two Gigabit combination ports with RJ-45 connectors and associated SFP slots.

Power-over-Ethernet Capability

The switch's 24 10/100 Mbps ports support the IEEE 802.3af Power-over-Ethernet (PoE) standard that enables DC power to be supplied to attached devices using wires in the connecting Ethernet cable. Any 802.3af compliant device attached to a port can directly draw power from the switch over the Ethernet cable without requiring its own separate power source. This capability gives installers greater flexibility in deployment locations for devices such as IP cameras and wireless access points, which translates into greater network availability.

For each attached 802.3af-compliant device, the switch automatically senses the load and dynamically supplies the required power. The switch delivers power to a device using the two wire pairs in UTP or STP cable that are not used for 10BASE-T/100BASE-TX connections. Each port can provide up to 15.4

W of power at the standard -48 DC voltage. Independent overload and short-circuit protection for each port allows the switch to automatically shut down a port's power when limits are exceeded.

Network devices such as IP phones, wireless access points, and network cameras, typically consume less than 10 W of power, so they are ideal for Power-over-Ethernet applications.

Network Management Arrangement

With a comprehensive arrangement of LEDs, this switch provides "at a glance" monitoring of network and port status. The switch can be managed over the network with a web browser Telnet application, or via a direct connection to the console port. The switch includes a built-in network management agent that allows it to be managed in-band using SNMP or RMON (Groups 1, 2, 3, 9) protocols. It also has an RS-232 serial port (DB-9 connector) on the front panel for out-of-band management. A PC may be connected to this port for configuration and monitoring out-of-band via a null-modem serial cable. (See "Cables" on page 31. for wiring options.)

For a detailed description of the advanced features, refer to the Software Configuration Guide

The switch uses DVMRP protocol to determine the routing for multicast packets. If no hosts have subscribed to the indicated multicast service, the packet will be dropped.

Description of Hardware

Physical Description

The NXA-ENET24 and the NXA-ENET24 PoE Fast Ethernet switches measure 17.32 x 16.14 x 1.69 inches (44.0 x 41.0 x 4.3 cm).

10/100BASE-T Ports

The PoE switch base unit contains 24 10BASE-T/100BASE-TX RJ-45 ports. All ports support automatic MDI/MDI-X operation, so you can use straight-through cables for all network connections to PCs or servers, or to other switches or hubs. (See “10/100BASE-TX Pin Assignments” on page 31.)

Each of these ports support auto-negotiation, so the optimum transmission mode (half or full duplex), and data rate (10 or 100 Mbps) can be selected automatically. If a device connected to one of these ports does not support auto-negotiation, the communication mode of that port can be configured manually.

Each port also supports IEEE 802.3x auto-negotiation of flow control, so the switch can automatically prevent port buffers from becoming saturated.

1000BASE-T/SFP Ports

These are combination Gigabit RJ-45 ports with alternate Small Form Factor Pluggable (SFP) transceiver slots. If an SFP transceiver (purchased separately) is installed in a slot and has a valid link on the port, the associated RJ-45 port is disabled.

The 1000BASE-T RJ-45 ports support automatic MDI/MDI-X operation, so you can use straight-through cables for all network connections to PCs or servers, or to other switches or hubs. (See “1000BASE-T Pin Assignments” on page 33.)

The 1000BASE-T RJ-45 ports do not support PoE capability.

Port and System Status LEDs

The switch base unit also includes a display panel for key system and port indications that simplify installation and network troubleshooting. The LEDs, which are located on the front panel for easy viewing, are shown below and described in the following tables.

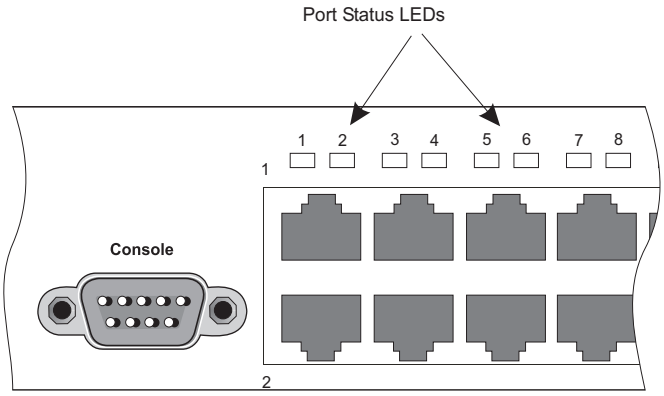

FIG. 2 Port LEDs

The port status LEDs have two display modes; Link and PoE. The Link mode displays the link status and network activity on each port. The PoE mode displays the PoE power status on each port. Use the Mode Link/PoE button (See “Mode PoE/Link Button” on page 6.) on the front panel to toggle between the two display modes. The current mode is indicated by the Link/Act and PoE system LEDs.

Port Status LEDs		
LED	**Condition**	**Status**
1~24 (Link/Act Mode)	On/Flashing Green	Port has established a valid 100 Mbps network connection. Flashing indicates activity.
	On/Flashing Amber	Port has established a valid 10 Mbps network connection. Flashing indicates activity.
	Alternate Green/Amber	Port has been disabled by the administrator.
	Off	There is no valid link on the port.
1~24 (PoE Mode)	On Green	Powered device is connected, but not drawing power.
	Flashing Green	Powered device is receiving power.
	Flashing Amber	Port has detected a power overload or short circuit and shut down the port's power.
	On Amber	The power budget for the switch has been exceeded and the port's power shut down.
	Alternate Green/Amber	Port has been disabled by the administrator.
	Off	No powered device is connected to the port.

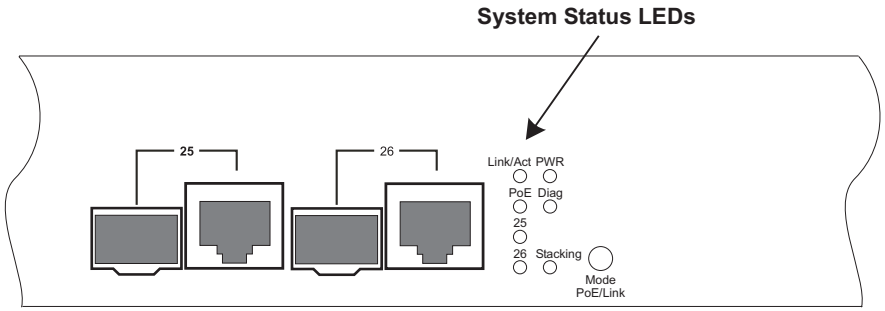

FIG. 3 System LEDs

System Status LEDs		
LED	**Condition**	**Status**
PWR	On Green	Unit's internal power supply is operating normally.
	Off	Unit has no power connected.
Diag	On Green	System diagnostic test successfully completed.
	Flashing Green	System diagnostic test is in progress.
	On Amber	System diagnostic test has detected a fault.
	Flashing Amber	Cannot receive packet from stacking port.
	Alternate Green/Amber	Fan has failed or the unit has over-heated.
Stacking	On Green	This switch is acting as the master unit in the stack.
	Flashing Green	Initial state of stacking configuration to determine whether the switch will act as a master or slave unit.
	On Amber	This switch is acting as a slave unit in the stack.
Link/Act	On Green	LED display mode is Link/Act.
PoE	On Green	LED display mode is PoE.
Combination Ports		
25-26 (Link/Activity)	On/Flashing Amber	Port has established a valid 10/100 Mbps network connection. Flashing indicates activity.
	On/Flashing Green	Port has established a valid 1000 Mbps network connection. Flashing indicates activity.
	Off	There is no valid link on the port.

Stack Master Button

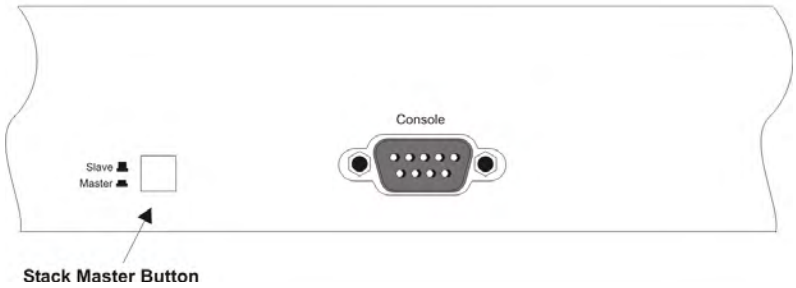

FIG. 4 Stack Unit ID LCD

The Stack Master button enables one switch in the stack to be selected as the master. Seven other switches can be stacked together and they should be placed in "Slave" mode. When operating in a stand-alone configuration the switch should be in "Master" mode.

Mode PoE/Link Button

The Mode PoE/Link button is located on the front panel.

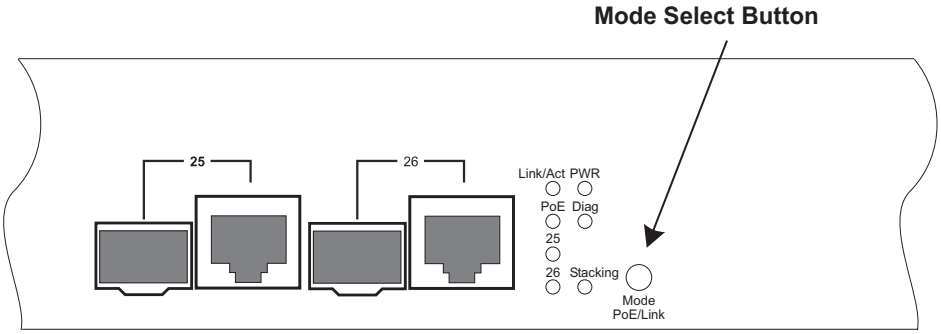

FIG. 5 Mode Selection

The Mode PoE/Link button is used to toggle between the two port status LED display modes (See “Port and System Status LEDs” on page 3.). Pressing this button changes from one display mode to the other. The default display mode is Link/Act mode.

Power Supply Receptacle

The standard power receptacle is for the AC power cord. It is located on the rear panel of the switch.

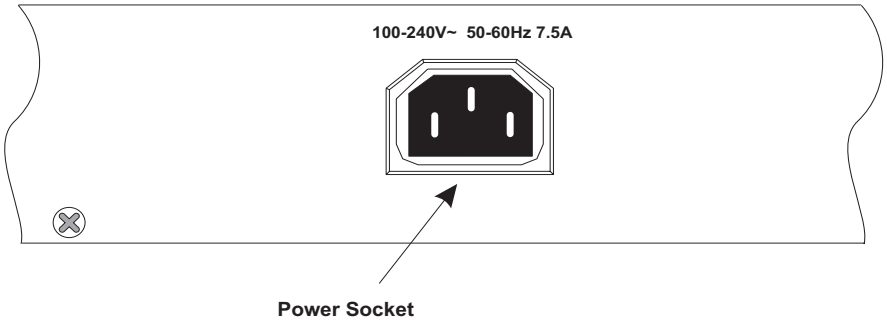

FIG. 6 Power Supply Receptacle

Features and Benefits

Connectivity

- 24 dual-speed ports for easy Fast Ethernet integration
- All 10/100 RJ-45 ports support the IEEE 802.3af standard Power-over-Ethernet
- Two Gigabit combination ports—use either the 10/100/1000BASE-T RJ-45 port or the Small Form Factor Pluggable (SFP) transceiver slot
- Auto-negotiation enables each RJ-45 port to automatically select the optimum communication mode (half or full duplex) if this feature is supported for the attached device
- Independent RJ-45 10/100BASE-TX ports with auto MDI/MDI-X
- Unshielded (UTP) cable supported on all RJ-45 ports: Category 3 or better for 10 Mbps connections, Category 5 or better for 100 Mbps connections, and Category 5, 5e or 6 for 1000 Mbps connections
- IEEE 802.3u, IEEE 802.3z, and IEEE 802.3ab compliant

Performance

- Automatically Configured to support MAX audio/video streams
- Transparent bridging
- Aggregate duplex bandwidth of up to 8.8 Gbps
- Switching table with a total of 8K MAC address entries
- Store-and-Forward switching
- Wire-speed filtering and forwarding
- Supports flow control, using back pressure for half duplex and IEEE 802.3x for full duplex
- Auto MDI/MDIX on all 10/100BASE-TX ports
- Head-of-Line blocking
- Broadcast storm control
- Desktop or rack-mountable
- Stacking capability for up to eight units

Management

- “At-a-glance” LEDs for easy troubleshooting
- Network management agent:
  - Manages switch in-band or out-of-band
  - Supports Telnet, SNMP/RMON and web-based interface

Network Planning

Introduction to Switching

A network switch allows simultaneous transmission of multiple packets via non-crossbar switching. This means that it can partition a network more efficiently than bridges or routers. The switch has, therefore, been recognized as one of the most important building blocks for today's networking technology.

When performance bottlenecks are caused by congestion at the network access point (such as the network card for a high-volume file server), the device experiencing congestion (server, power user, or hub) can be attached directly to a switched port. By using full-duplex mode, the bandwidth of the dedicated segment can be doubled to maximize throughput.

When networks are based on repeater (hub) technology, the maximum distance between end stations is limited. For Ethernet, there may be up to four hubs between any pair of stations; for Fast Ethernet, the maximum is two; and for Gigabit Ethernet the maximum is one. This is known as the hop count. However, a switch turns the hop count back to zero. So subdividing the network into smaller and more manageable segments, and linking them to the larger network by means of a switch, removes this limitation.

A switch can be easily configured in any network to significantly boost bandwidth while using conventional cabling and network cards.

Application Examples

The PoE switch is not only designed to segment your network, but also to provide a wide range of options in setting up network connections. Some typical applications are described below.

MAX A/V Network

The switch is an excellent choice for mixed AMX equipment such as PoE enabled NXA-WAP 200 G wireless access points, and non-PoE devices such as AVMs, Breakout Boxes and MAX. You can easily build on this basic configuration, adding direct full-duplex connections to AVMs, Breakout Boxes and WAPs. When the time comes for further expansion, just connect to another hub or switch via one of the switch's Fast Ethernet or Gigabit Ethernet ports.

In the figure below, the switch is operating as a MAX A/V network for a small LAN.

It is providing dedicated 1000 Mbps full-duplex connections to MAX, 100 Mbps full-duplex connections to the Master, AVMs and Breakout Boxes. In addition, connected wireless access points are receiving PoE power from the switch.

The switch automatically identifies the devices requirements, i.e., power for the WAP200G and network priority for MAX streams to the AVMs so no configuration is required by the installer.

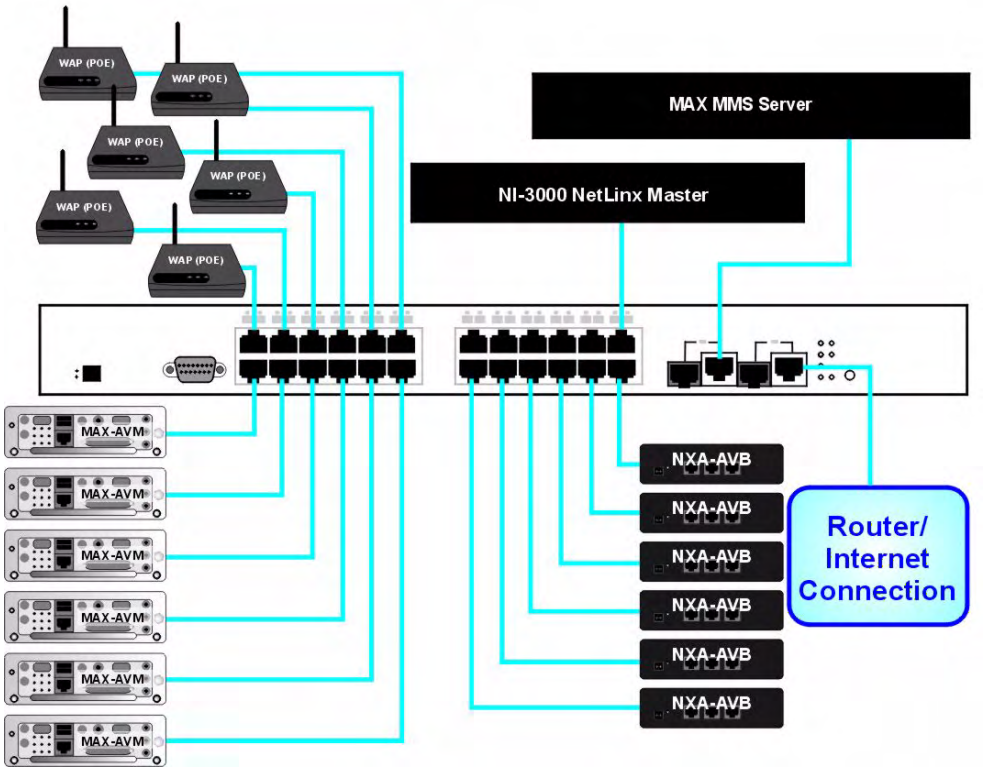

FIG. 7 MAX A/V Network

Ports	
Port Number	**Description**
1 - 24	Ports 1 - 24 can be used to connect AMX's Master, AVMs, Breakout Boxes, WAP 200 Gs and/ or other Ethernet based devices requiring 10 or 100 Mbps data throughput. In addition, ports 1 - 24 support PoE with automatic power detection. • If the connected device does not support PoE the switch will not turn "On" power to that port.
25	This port provides 10/100/1000 Mbps data throughput and can be used to support MAX units or stacking other switches together. The PoE is not supported on this port.
26	This port provides 10/100/1000 Mbps data throughput and can be used to support MAX units, or connections to the LAN/Internet. The PoE is not supported on this port.

Network Aggregation Plan

With 24 parallel bridging ports (i.e., 24 distinct collision domains), the PoE switch can collapse a complex network down into a single efficient bridged node, increasing overall bandwidth and throughput.

When up to eight switch units are stacked together, they form a single "virtual" switch containing up to 200 ports. The whole stack can be managed through the Master unit using a single IP address.

In the figure below, the 10BASE-T/100BASE-TX ports in a switch stack are providing 100 Mbps connectivity for up to 72 segments. In addition, the stack is also connecting several servers at 1000 Mbps.

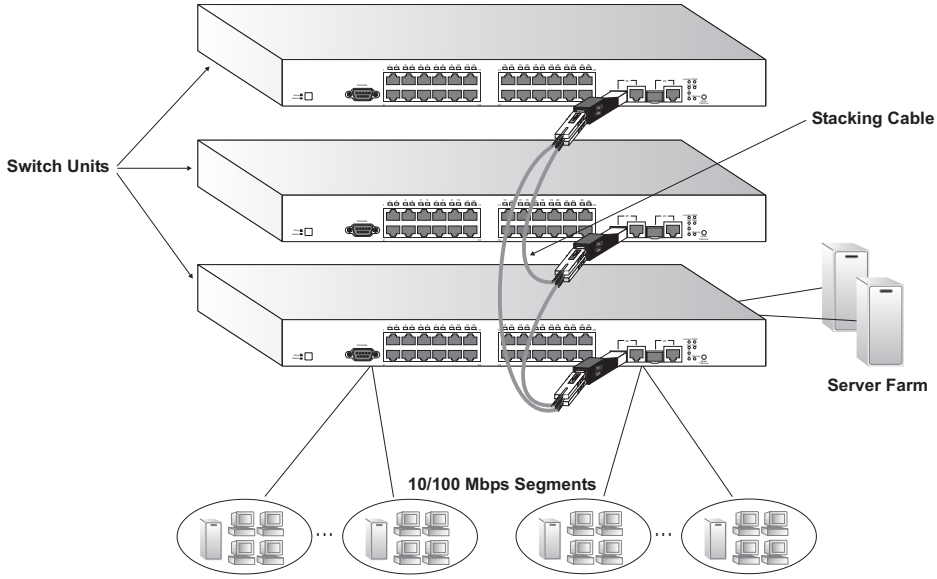

FIG. 8 Network Aggregation Plan

Remote Connections with Fiber Cable

Fiber optic technology allows for longer cabling than any other media type. Using a 1000BASE-SX multimode fiber (MMF) SFP transceiver, you can run a link up to 550 m. A 1000BASE-LX single-mode fiber (SMF) link can run up to 5 km. A 1000BASE-LH single-mode fiber (SMF) link can run up to 70 km. This allows the switch to serve as a collapsed backbone, providing direct connectivity for a widespread LAN.

1000BASE-LX or 1000BASE-LH SFP transceivers can be used to interconnect remote network segments, or can be used to provide a link to other buildings in a campus setting. 1000BASE-SX SFP transceivers can be used for Gigabit fiber connections between floors in the same building.

The figure below illustrates this switch connecting multiple segments with fiber cable.

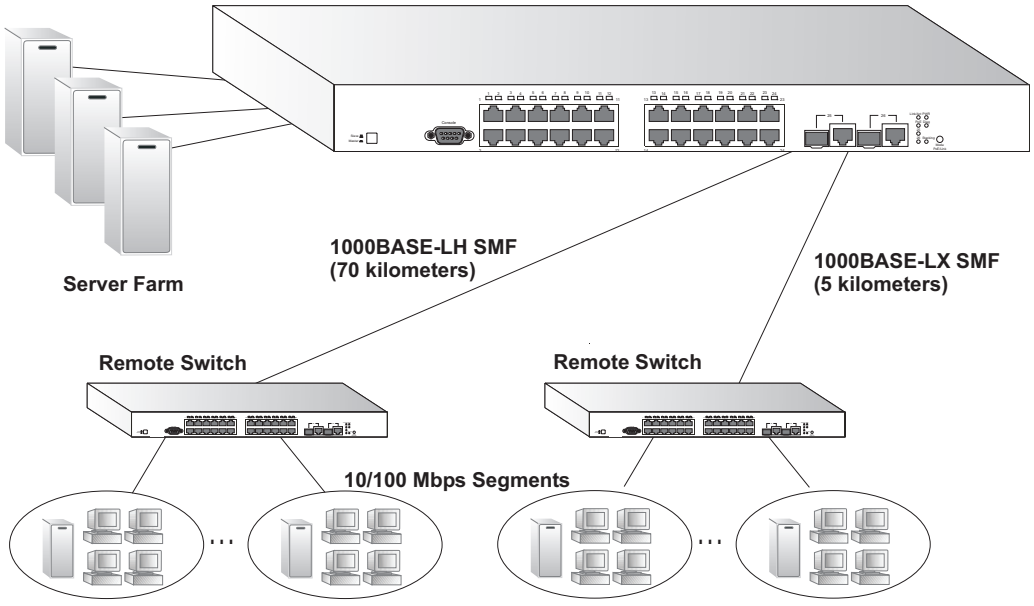

FIG. 9 Remote Connections with Fiber Cable

Making VLAN Connections

This switch supports VLANs which can be used to organize any group of network nodes into separate broadcast domains. VLANs confine broadcast traffic to the originating group, and can eliminate broadcast storms in large networks. This provides a more secure and cleaner network environment.

VLANs can be based on untagged port groups, or traffic can be explicitly tagged to identify the VLAN group to which it belongs. Untagged VLANs can be used for small networks attached to a single switch. However, tagged VLANs should be used for larger networks, and all the VLANs assigned to the inter-switch links.

The switch also supports multiple spanning trees which allow VLANs groups to maintain a more stable path between all VLAN members. This can reduce the overall amount of protocol traffic crossing the network, and provide a shorter reconfiguration time when any link in the spanning tree fails.

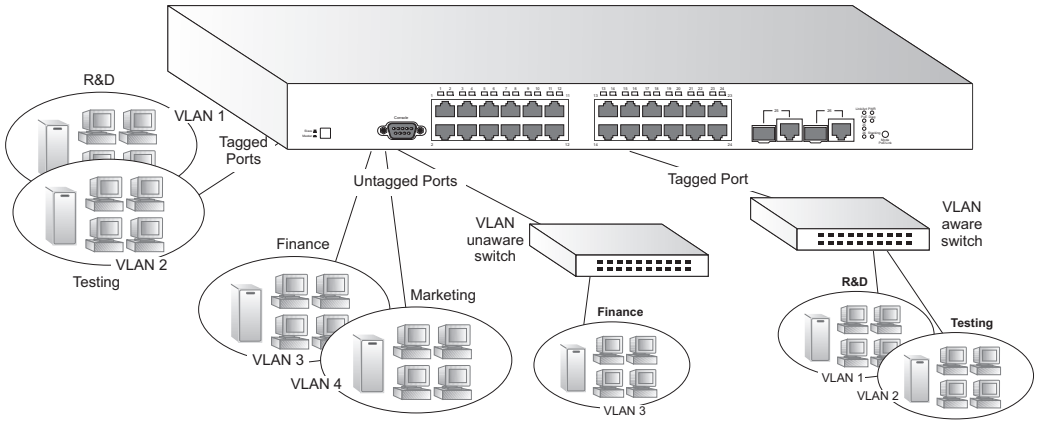

FIG. 10 Making VLAN Connections

When connecting to a switch that does not support IEEE 802.1Q VLAN tags, use untagged ports.

Application Notes

1. Full-duplex operation only applies to point-to-point access (such as when a switch is attached to a workstation, server or another switch). When the switch is connected to a hub, both devices must operate in half-duplex mode.
2. Avoid using flow control on a port connected to a hub unless it is actually required to solve a problem. Otherwise back pressure jamming signals may degrade overall performance for the segment attached to the hub.
3. As a general rule the length of fiber optic cable for a single switched link should not exceed:
   - 1000BASE-SX: 550 m (1805 ft) using multimode fiber
   - 1000BASE-LX: 5 km (3.2 miles) using single-mode fiber
   - 100BASE-LH: 70 km (43.5 miles) using single-mode fiber

However, power budget constraints must also be considered when calculating the maximum cable length for your specific environment.

Installing the Switch

Selecting a Site

Switch units can be mounted in a standard 19-inch equipment rack or on a flat surface. Be sure to follow the guidelines below when choosing a location.

- The site should:
  - be at the center of all the devices you want to link and near a power outlet.
  - be able to maintain its temperature within 0 to 50 °C (32 to 122 °F), and its humidity within 5% to 95%, non-condensing
  - provide adequate space (approximately two inches) on all sides for proper air flow
  - be accessible for installing, cabling, and maintaining the devices
  - allow the status LEDs to be clearly visible
- Make sure that twisted-pair cable is always routed away from power lines, fluorescent lighting fixtures and other sources of electrical interference, such as radios and transmitters.
- Make sure that the unit is connected to a separate grounded power outlet that:
  - provides 100 to 240 VAC, 50 to 60 Hz
  - is within 2.44 m (8 feet) of each device
  - is powered from an independent circuit breaker
- As with any equipment, using a filter or surge suppressor is recommended.

Ethernet Cabling

To ensure proper operation when installing the switch into a network, make sure that the current cables are suitable for 10BASE-T or 100BASE-TX operation. Check the following criteria against the current installation of your network:

- Cable type: Unshielded twisted pair (UTP) or shielded twisted pair (STP) cables with RJ-45 connectors; Category 3 or better for 10BASE-T and Category 5 or better for 100BASE-TX.
- Protection from radio frequency interference emissions
- Electrical surge suppression
- Separation of electrical wires (switch related or other) and electromagnetic fields from data based network wiring
- Safe connections with no damaged cables, connectors or shields

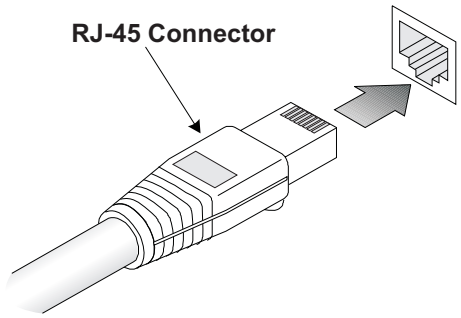

FIG. 11 RJ-45 Connections

Equipment Checklist

After unpacking this switch, check the contents to be that sure you have received all the components. Then, before beginning the installation, be sure that you have all other necessary installation equipment.

Package Contents

- 24-Port Fast Ethernet PoE Switch
- AC power cord
- Serial cable
- Rack mounting kit
- Quick Start Guide
- Hardware Installation and Software Configuration manuals can be downloaded via **AMX.com**

Optional Rack-Mounting Equipment

If you plan to rack-mount the switch, be sure to have the following equipment available:

- Four mounting screws for each device you plan to install in a rack—these are not included
- A screwdriver (Phillips or flathead, depending on the type of screws used)

Mounting

This switch can be mounted in a standard 19-inch equipment rack or on a desktop or shelf. Mounting instructions for each type of site follow.

Rack Mounting

Before rack mounting the switch, pay particular attention to the following factors:

- Temperature: Since the temperature within a rack assembly may be higher than the ambient room temperature, check that the rack-environment temperature is within the specified operating temperature range.
- Mechanical Loading: Do not place any equipment on top of a rack-mounted unit.
- Circuit Overloading: Be sure that the supply circuit to the rack assembly is not overloaded.
- Grounding: Rack-mounted equipment should be properly grounded. Particular attention should be given to supply connections other than direct connections to the mains.

To rack-mount devices:

1. Attach the brackets to the device using the screws provided in the Bracket Mounting Kit.

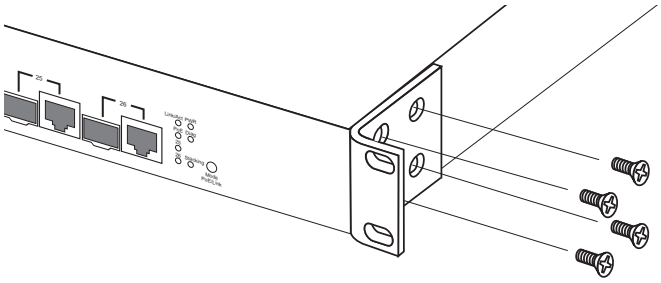

FIG. 12 Attaching the Brackets

2. Mount the device in the rack, using four rack-mounting screws (not provided).

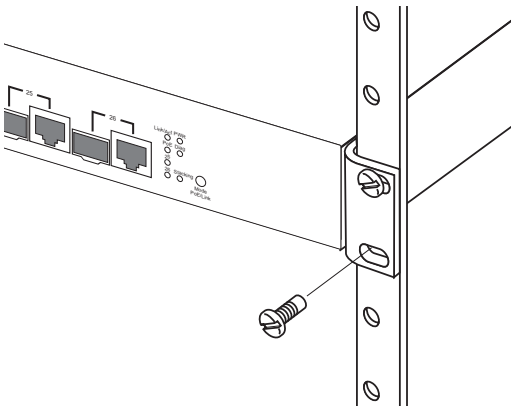

FIG. 13 Installing the Switch in a Rack

3. If installing a single switch only, turn to “Connecting to a Power Source” at the end of this chapter.
4. If installing multiple switches, mount them in the rack, one below the other, in any order.

Desktop or Shelf Mounting

1. Attach the four adhesive feet to the bottom of the first switch.

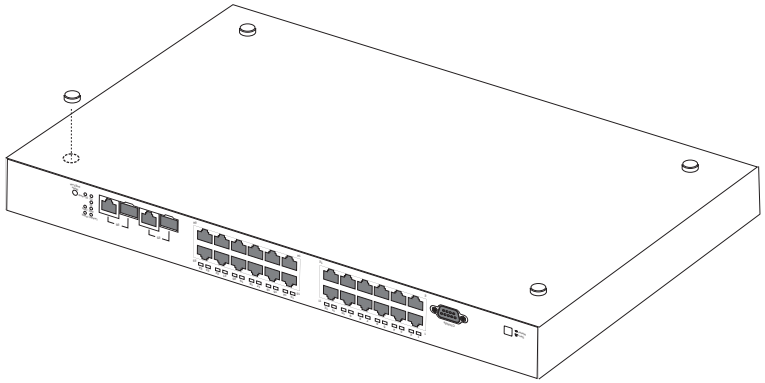

FIG. 14 Attaching the Adhesive Feet

2. Set the device on a flat surface near an AC power source, making sure there are at least two inches of space on all sides for proper air flow.
3. If installing a single switch only, go to “Connecting to a Power Source” at the end of this chapter.
4. If installing multiple switches, attach four adhesive feet to each one. Place each device squarely on top of the one below, in any order.

Installing a Third Party SFP Transceiver

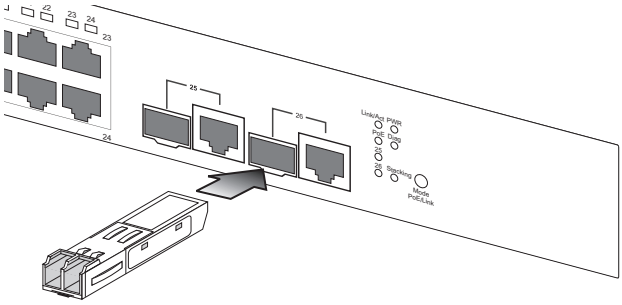

FIG. 15 Installing an SFP Transceiver

To install an SFP transceiver, perform the following steps:

1. Consider your network and cabling requirements to select an appropriate SFP transceiver type.
2. Insert the transceiver with the optical connector facing outward and the slot connector facing down. Note that SFP transceivers are keyed so they can only be installed in one orientation.
3. Slide the SFP transceiver into the slot until it clicks into place.

NOTE

SFP transceivers are hot-swappable. The switch does not need to be powered off before installing or removing a transceiver. However, always first disconnect the network cable before removing a transceiver.

Stacking Switches

The switch supports stacking up to eight units through an SFP stacking transceiver. The stacking transceiver must be installed in the port 25 slot. Each stacking transceiver has two connectors, Tx and Rx, for attaching stacking cables. FIG. 17 shows how stacking cables are connected between switches in a stack. It is not possible to stack PoE switches with non-PoE switches; however, establishing trunks between the two can provide similar results.

NOTE

The stacking transceiver must only be installed in the port 25 SFP slot.

Installing a Stacking Transceiver

The stacking transceiver must be installed in the port 25 slot. It should be inserted before any of the systems in the stack are powered on.

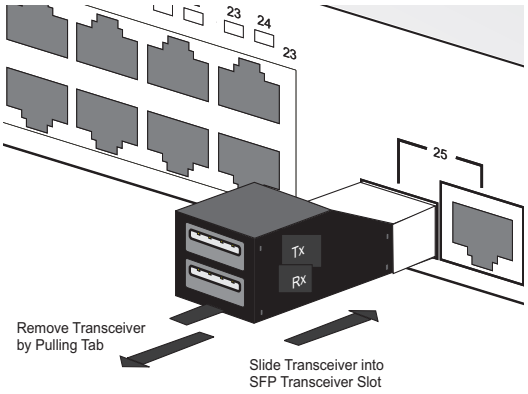

FIG. 16 Installing a Stacking Transceiver

Slide the SFP transceiver into the SFP transceiver slot until it clicks into place. To remove, pull on the tab at the bottom of the front of the transceiver.

Connecting Switches in a Stack Using a Transceiver

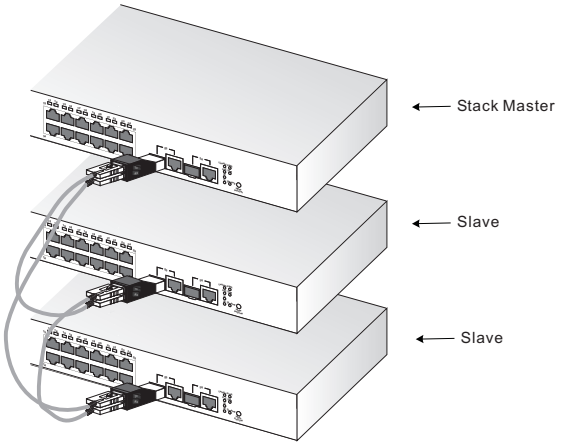

FIG. 17 Connecting Switches in a Stack

NOTE

The stacking transceiver must only be installed in the port 25 SFP slot.

To connect up to eight switches in a stack, perform the following steps:

1. Install SFP stacking transceivers into the port 25 slot for each switch in the stack.
2. Plug one end of a stack cable into the Tx (top) port of the top unit
3. Plug the other end of the stack cable into the Rx (bottom) port of the next unit.
4. Repeat steps 1 and 2 for each unit in the stack. Form a simple chain starting at the Tx port on the top unit and ending at the Rx port on the bottom unit (stacking up to 8 units).
5. Complete the stack connections by plugging one end of a stack cable into the Tx port on the bottom unit and the other end into the Rx port on the top unit.

6. Select the Master unit in the stack by pressing the push button in on only one of the switches. Only one switch in the stack can operate as the Master, all other units operate in slave mode. If more than one switch in the stack is selected as Master, or if no switches are selected, the stack will not function.

NOTE

The stacking feature requires that all stacking transceiver ports be connected and the switches powered on. If one stack link is not connected, or if a switch is powered off, the stack will not function.

Connecting Switches in a Ring-topology Stack

FIG. 18 shows how the stack cables are connected between switches in a stack. The connection uses Category 5 Ethernet cables. The switch supports a line and ring-topology stacking configuration, or can be used stand alone.

In line-topology stacking, there is a single stack cable connection between each switch that carries two-way communications across the stack. In ring-topology stacking, an extra cable is connected between the top and bottom switches forming a "ring" or "closed-loop." The closed-loop cables provides a redundant path for the stack link, so if one link fails, stack communications can be maintained. FIG. 18 illustrates a ring-topology stacking configuration.

To connect up to eight switches in a stack, perform the following steps:

1. Enable the stacking ports in each unit (i.e., the Stack button pushed out).

NOTE

Pressing the Stack button during normal operation will cause the system to reboot.

2. Plug one end of a stack cable into the "Up" (right) port of the top unit.
3. Plug the other end of the stack cable into the "Down" (left) port of the next unit.
4. Repeat steps 1 and 2 for each unit in the stack. Form a simple chain starting at the "Up" port on the top unit and ending at the "Down" port on the bottom unit (stacking up to 8 units).
5. For ring-topology stacking, complete the connections by plugging one end of a stack cable into the Up port on the bottom unit and the other end into the Down port on the top unit.

FIG. 18 Connecting Switches in a Ring-topology Stack

6. Select the Master unit in the stack by pressing in the Master button on only one of the switches. Only one switch in the stack can operate as the Master, all other units operate in slave mode. If more than one switch in the stack is selected as Master, or if no switches are selected, the stack will not function.

Connecting to a Power Source

To connect a switch to a power source:

1. Insert the power cable plug directly into the AC receptacle located at the back of the switch.

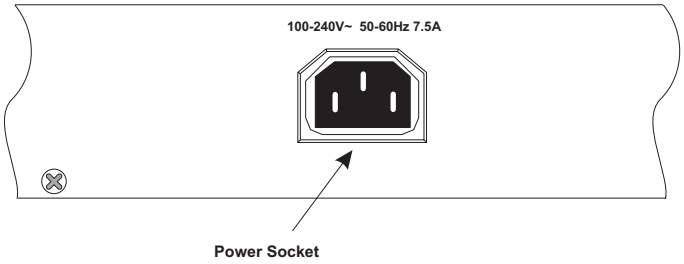

FIG. 19 Power Receptacle

2. Plug the other end of the cable into a grounded, 3-pin socket, AC power source.

NOTE

For international use, you may need to change the AC line cord. You must use a line cord set that has been approved for the receptacle type in your country.

3. Check the front-panel LEDs as the device is powered on to be sure the PWR LED is lit. If not, check that the power cable is correctly plugged in.

Connecting to the Console Port

The DB-9 serial port on the switch's front panel is used to connect to the switch for out-of-band console configuration. The command-line configuration program can be accessed from a terminal or a PC running a terminal emulation program. The pin assignments used to connect to the serial port are provided in the following table.

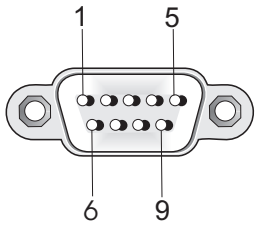

FIG. 20 Serial Port (DB-9 DTE) Pin-Out

Wiring Map for Serial Cable

Serial Cable Wiring		
Switch's 9-Pin Serial Port	**Null Modem**	**PC's 9-Pin DTE Port**
2 RXD (receive data)	<----------	3 TXD (transmit data)
3 TXD (transmit data)	---------->	2 RXD (receive data)
5 SGND (signal ground)	----------	5 SGND (signal ground)

No other pins are used.

The serial port's configuration requirements are as follows:

- Default Baud rate—9,600 bps
- Character Size—8 Characters
- Parity—None
- Stop bit—One
- Data bits—8

Making Network Connections

Connecting Network Devices

The PoE switch is designed to be connected to 10 or 100 Mbps network cards in PCs and servers, as well as to other switches and hubs.

If 802.3af-compliant PoE devices are connected to the switch's 10/100 Mbps ports, the switch automatically supplies the required power.

Twisted-Pair Devices

Each device requires an unshielded twisted-pair (UTP) cable with RJ-45 connectors at both ends. Use Category 5, 5e or 6 cable for 1000BASE-T connections, Category 5 or better for 100BASE-TX connections, and Category 3 or better for 10BASE-T connections.

Power-over-Ethernet Connections

The PoE switch automatically detects an 802.3af-compliant device by its authenticated PoE signature and senses its required load before turning on DC power to the port. This detection mechanism prevents damage to other network equipment that is not 802.3af complaint.

Power-over-Ethernet connections work with all existing Category 3, 4, 5, 5e or 6 network cabling, including patch cables and patch-panels, outlets, and other connecting hardware, without requiring modification.

The switch delivers power to a device using the two unused wire pairs in UTP or STP cable (RJ-45 pins 4, 5, 7, and 8). The switch can provide up to 15.4 W of power continuously on each 10/100 Mbps port. However, taking into account some power loss over the cable run, the amount of power that can be delivered to a terminal device is 12.95 W. If a device draws more than 15.4 W, from a port, an overload condition occurs and the port turns off the power.

The switch controls the power and data on a port independently. Power can be requested from a device that already has a data link to the switch. Also, the switch can supply power to a device even if the port's data connection has been disabled. The power on a port is continuously monitored by the switch and it will be turned off as soon as a device connection is removed.

Cabling Guidelines

The RJ-45 ports on the switch support automatic MDI/MDI-X pinout configuration, so you can use standard straight-through twisted-pair cables to connect to any other network device (PCs, servers, switches, routers, or hubs).

See "Cables" on page 31. for further information on cabling.

Do not plug a normal phone jack connector into an RJ-45 port. This will damage the switch. Use only twisted-pair cables with RJ-45 connectors that conform to FCC standards.

Connecting to MAX, AVM, WAPs, Breakout Boxes, Servers, Hubs and Switches

1. Attach one end of a twisted-pair cable segment to the device's RJ-45 connector.

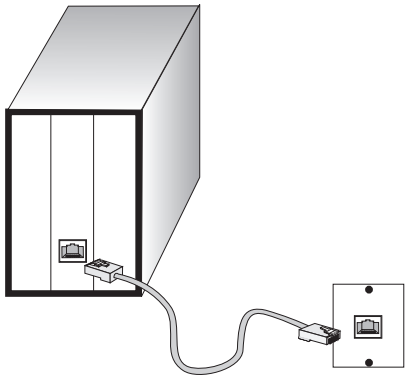

FIG. 21 Making Twisted-Pair Connections

2. If the device is a network card and the switch is in the wiring closet, attach the other end of the cable segment to a modular wall outlet that is connected to the wiring closet. (See "Network Wiring Connections" on page 25.) Otherwise, attach the other end to an available port on the switch.

   Make sure each twisted pair cable does not exceed 100 meters (328 ft) in length.

Avoid using flow control on a port connected to a hub unless it is actually required to solve a problem. Otherwise back pressure jamming signals may degrade overall performance for the segment attached to the hub.

3. As each connection is made, the green Link LED (on the switch) corresponding to each port will light to indicate that the connection is valid.

Network Wiring Connections

Today, the punch-down block is an integral part of many newer equipment racks. It is actually part of the patch panel. Instructions for making connections in the wiring closet with this type of equipment follow.

1. Attach one end of a patch cable to an available port on the switch, and the other end to the patch panel.
2. If not already in place, attach one end of a cable segment to the back of the patch panel where the punch-down block is located, and the other end to a modular wall outlet.
3. Label the cables to simplify future troubleshooting.

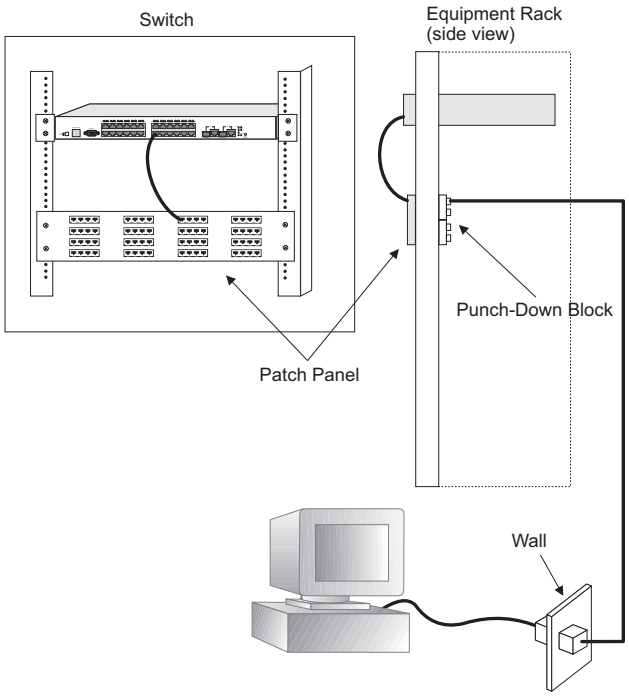

FIG. 22 Network Wiring Connections

Fiber Optic Devices

An optional slide-in 1000BASE-SX, 1000BASE-LX, or 1000BASE-LH SFP transceiver may be used for backbone or remote connections, or for connecting to a high-speed server.

Each single-mode fiber optic port requires 9/125 micron single-mode fiber optic cabling with an LC connector at both ends. Each multimode fiber optic port requires 50/125 or 62.5/125 micron multimode fiber optic cabling with an LC connector at both ends.

This switch uses lasers to transmit signals over fiber optic cable. The lasers are compliant with the requirements of a Class 1 Laser Product and are inherently eye safe in normal operation. However, you should never look directly at a transmit port when it is powered on.

1. Remove and keep any protective port covers. When not connected to a fiber cable, the cover should be replaced to protect the optics.
2. Check that the fiber terminators are clean. You can clean the cable plugs by wiping them gently with a clean tissue or cotton ball moistened with a little ethanol. Dirty fiber terminators on fiber optic cables will impair the quality of the light transmitted through the cable and lead to degraded performance on the port.

3. Connect one end of the cable to the LC port on the switch and the other end to the port on the other device. Since LC connectors are keyed, the cable can be attached in only one orientation.

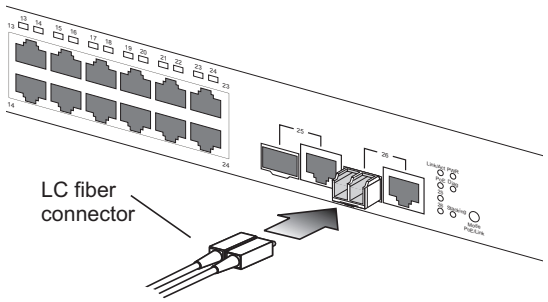

FIG. 23 Making Fiber Port Connections

4. As a connection is made, check the green Link LED on the switch corresponding to the port to be sure that the connection is valid.

Connectivity Rules

When adding hubs (repeaters) to your network, please follow the connectivity rules listed in the manuals for these products. However, note that because switches break up the path for connected devices into separate collision domains, you should not include the switch or connected cabling in your calculations for cascade length involving other devices.

1000BASE-T Cable Requirements

All Category 5 UTP cables that are used for 100BASE-TX connections should also work for 1000BASE-T, providing that all four wire pairs are connected. However, it is recommended that for all critical connections, or any new cable installations, Category 5e (enhanced Category 5) or Category 6 cable should be used. The Category 5e and 6 specifications include test parameters that are only recommendations for Category 5. Therefore, the first step in preparing existing Category 5 cabling for running 1000BASE-T is a simple test of the cable installation to be sure that it complies with the IEEE 802.3ab standards.

1000 Mbps Gigabit Ethernet Collision Domain

Maximum 1000BASE-T Gigabit Ethernet Cable Length		
Cable Type	**Maximum Cable Length**	**Connector**
Category 5, 5e, or 6 100-ohm UTP or STP	100 m (328 ft)	RJ-45

Maximum 1000BASE-SX Gigabit Ethernet Cable Lengths			
Fiber Size	**Fiber Bandwidth**	**Maximum Cable Length**	**Connector**
62.5/125 micron multimode fiber	160 MHz/km	2-220 m (7-722 ft)	LC
	200 MHz/km	2-275 m (7-902 ft)	LC
50/125 micron multimode fiber	400 MHz/km	2-500 m (7-1641 ft)	LC
	500 MHz/km	2-550 m (7-1805 ft)	LC

Maximum 1000BASE-LX Gigabit Ethernet Cable Length			
Fiber Size	**Fiber Bandwidth**	**Maximum Cable Length**	**Connector**
9/125 micron single-mode fiber	N/A	2 m - 5 km (7 ft - 3.2 miles)	LC

Maximum 1000BASE-LH Gigabit Ethernet Cable Length			
Fiber Size	**Fiber Bandwidth**	**Maximum Cable Length**	**Connector**
9/125 micron single-mode fiber	N/A	2 m - 70 km (7 ft - 43.5 miles)	LC

100 Mbps Fast Ethernet Collision Domain

Maximum Fast Ethernet Cable Lengths			
Type	**Cable Type**	**Max. Cable Length**	**Connector**
100BASE-TX	Category 5 or better 100-ohm UTP or STP	100 m (328 ft)	RJ-45
100BASE-FX Multimode	50/125 or 62.5/125 micron core multimode fiber (MMF)	2 km (1.24 miles)	SC
100BASE-FX Single-mode	9/125 micron core single-mode fiber (SMF)	20 km (12.43 miles)	SC

10 Mbps Ethernet Collision Domain

Maximum Ethernet Cable Length		
Cable Type	**Maximum Length**	**Connector**
Twisted Pair, Category 3 or better 100-ohm UTP	100 m (328 ft)	RJ-45

Cable Labeling and Connection Records

When planning a network installation, it is essential to label the opposing ends of cables and to record where each cable is connected. Doing so will enable you to easily locate inter-connected devices, isolate faults and change your topology without need for unnecessary time consumption.

To best manage the physical implementations of your network, follow these guidelines:

- Clearly label the opposing ends of each cable.
- Using your building's floor plans, draw a map of the location of all network-connected equipment. For each piece of equipment, identify the devices to which it is connected.
- Note the length of each cable and the maximum cable length supported by the switch ports.
- For ease of understanding, use a location-based key when assigning prefixes to your cable labeling.
- Use sequential numbers for cables that originate from the same equipment.
- Differentiate between racks by naming accordingly.
- Label each separate piece of equipment.
- Display a copy of your equipment map, including keys to all abbreviations at each equipment rack.

Troubleshooting

Diagnosing Switch Indicators

Troubleshooting Chart	
Symptom	**Action**
PWR LED is Off	• Internal power supply may be disconnected. Check connections between the switch, the power cord and the wall outlet.
Diag LED is Amber	• The system has detected a fault. Power cycle the switch to try and clear the condition. • If the condition does not clear, contact your dealer for assistance.
Diag LED is Flashing Amber	• Check that all stacking cables are properly connected.
Stack LED is Flashing Green or Amber	• The stack has not completed its initial configuration. Wait a few minutes for the process to complete. • If flashing continues, check that the Master Select button is pressed in on only one switch. • Check that all stacking cables are properly connected.
Link/Act LED is Off	• Verify that the switch and attached device are powered on. • Be sure the cable is plugged into both the switch and corresponding device. • If the switch is installed in a rack, check the connections to the punch-down block and patch panel. • Verify that the proper cable type is used and its length does not exceed specified limits. • Check the adapter on the attached device and cable connections for possible defects. Replace the defective adapter or cable if necessary.

Power and Cooling Problems

If the power indicator does not turn on when the power cord is plugged in, you may have a problem with the power outlet, power cord, or internal power supply. However, if the unit powers off after running for a while, check for loose power connections, power losses or surges at the power outlet, and verify that the fans on the unit are unobstructed and running prior to shutdown. If you still cannot isolate the problem, the internal power supply may be defective.

Installation

Verify that all system components have been properly installed. If one or more components appear to be malfunctioning (such as the power cord or network cabling), test them in an alternate environment where you are sure that all the other components are functioning properly.

In-Band Access

You can access the management agent in the switch from anywhere within the attached network using Telnet, a web browser, or other network management software tools. However, you must first configure the switch with a valid IP address, subnet mask, and default gateway. If you have trouble establishing a link to the management agent, check to see if you have a valid network connection. Then verify that you entered the correct IP address. Also, be sure the port through which you are connecting to the switch has not been disabled. If it has not been disabled, then check the network cabling that runs between your remote location and the switch.

The management agent accepts up to four simultaneous Telnet sessions. If the maximum number of sessions already exists, an additional Telnet connection will not be able to log into the system.

Stack Troubleshooting

If a stack fails to initialize or function, first check the following items:

- Check that all stacking cables are properly connected.
- Check if any stacking cables appear damaged.
- Check that only one Master Select button is pressed in.
- Check that all switches in the stack are powered on.

After checking all items, reboot all the switches in the stack. If the problem is still not resolved, contact your dealer for assistance.

Cables

Twisted-Pair Cable and Pin Assignments

CAUTION

DO NOT plug a normal phone jack connector into any RJ-45 port. Use only twisted-pair cables with RJ-45 connectors that conform with FCC standards.

For 10/100BASE-TX connections, the twisted-pair cable must have two pairs of wires. For 1000BASE-T connections the twisted-pair cable must have four pairs of wires. Each wire pair is identified by two different colors. For example, one wire might be green and the other, green with white stripes. Also, an RJ-45 connector must be attached to both ends of the cable.

CAUTION

Each wire pair must be attached to the RJ-45 connectors in a specific orientation. (See "Cabling Guidelines" on page 23. for an explanation.)

Figure B-1 illustrates how the pins on the RJ-45 connector are numbered. Be sure to hold the connectors in the same orientation when attaching the wires to the pins.

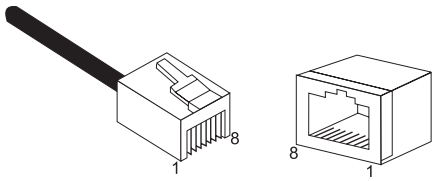

FIG. 24 RJ-45 Connector Pin Numbers

10/100BASE-TX Pin Assignments

Use unshielded twisted-pair (UTP) or shielded twisted-pair (STP) cable for RJ-45 connections: 100-ohm Category 3 or better cable for 10 Mbps connections, or 100-ohm Category 5 or better cable for 100 Mbps connections. Also be sure that the length of any twisted-pair connection does not exceed 100 meters (328 feet).

Data is delivered on the standard two wire pairs (pins 1, 2, 3, and 6), and PoE power is supplied using the two previously spare pairs (pins 4, 5, 7, and 8). Since the RJ-45 ports on the switch base unit support automatic MDI/MDI-X operation, you can use straight-through cables for all network connections to PCs or servers, or to other switches or hubs. In straight-through cable, pins 1, 2, 3, and 6, at one end of the cable, are connected straight through to pins 1, 2, 3, and 6 at the other end of the cable. When using any RJ-45 port on this switch, you can use either straight-through or crossover cable.

10/100BASE-TX MDI-X and MDI Port Pinouts		
Pin	**MDI Signal Name**	**MDI-X Signal Name**
1	Receive Data plus (RD+)	Transmit Data plus (TD+)
2	Receive Data minus (RD-)	Transmit Data minus (TD-)
3	Transmit Data plus (TD+)	Receive Data plus (RD+)
4	GND (Positive V_{port})	GND (Positive V_{port})
5	GND (Positive V_{port})	GND (Positive V_{port})
6	Transmit Data minus (TD-)	Receive Data minus (RD-)
7	-48V feeding power (Negative V_{port})	-48V feeding power (Negative V_{port})
8	-48V feeding power (Negative V_{port})	-48V feeding power (Negative V_{port})

Note: The “+” and “-” signs represent the polarity of the wires that make up each wire pair.

Straight-Through Wiring

If the twisted-pair cable is to join two ports and only one of the ports has an internal crossover (MDI-X), the two pairs of wires must be straight-through. (When auto-negotiation is enabled for any RJ-45 port on this switch, you can use either straight-through or crossover cable to connect to any device type.)

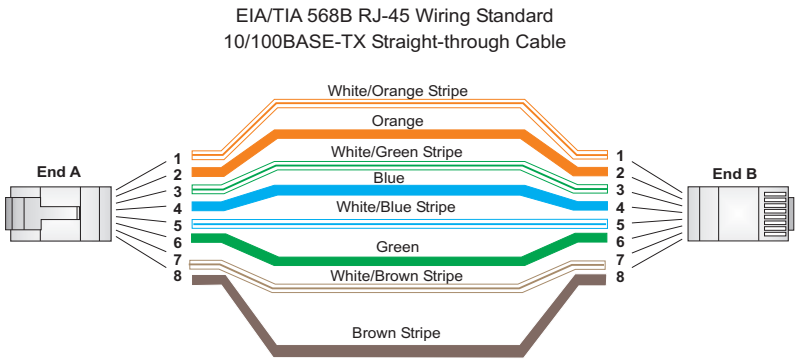

FIG. 25 Straight-through Wiring

Crossover Wiring

If the twisted-pair cable is to join two ports and either both ports are labeled with an “X” (MDI-X) or neither port is labeled with an “X” (MDI), a crossover must be implemented in the wiring. (When auto-negotiation is enabled for any RJ-45 port on this switch, you can use either straight-through or crossover cable to connect to any device type.)

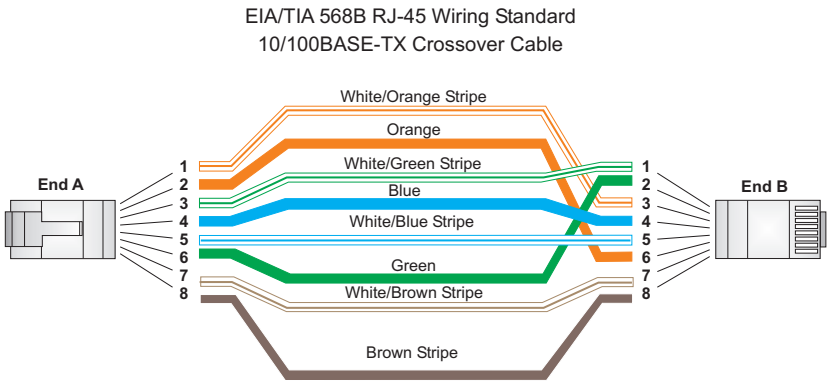

FIG. 26 Crossover Wiring

1000BASE-T Pin Assignments

All 1000BASE-T ports support automatic MDI/MDI-X operation, so you can use straight-through cables for all network connections to PCs or servers, or to other switches or hubs.

The table below shows the 1000BASE-T MDI and MDI-X port pinouts. These ports require that all four pairs of wires be connected. Note that for 1000BASE-T operation, all four pairs of wires are used for both transmit and receive.

Use 100-ohm Category 5, 5e or 6 unshielded twisted-pair (UTP) or shielded twisted-pair (STP) cable for 1000BASE-T connections. Also be sure that the length of any twisted-pair connection does not exceed 100 meters (328 feet).

1000BASE-T MDI-X and MDI Port Pinouts

1000BASE-T MDI-X and MDI Port Pinouts		
Pin	**MDI-X Signal Name**	**MDI Signal Name**
1	Bi-directional Data Two Plus (BI_D2+)	Bi-directional Data One Plus (BI_D1+)
2	Bi-directional Data Two Minus (BI_D2-)	Bi-directional Data One Minus (BI_D1-)
3	Bi-directional Data One Plus (BI_D1+)	Bi-directional Data Two Plus (BI_D2+)
4	Bi-directional Data Four Plus (BI_D4+)	Bi-directional Data Three Plus (BI_D3+)
5	Bi-directional Data Four Minus (BI_D4-)	Bi-directional Data Three Minus (BI_D3-)
6	Bi-directional Data One Minus (BI_D1-)	Bi-directional Data Two Minus (BI_D2-)
7	Bi-directional Data One Plus (BI_D3+)	Bi-directional Data One Plus (BI_D4+)
8	Bi-directional Data Three Minus (BI_D3-)	Bi-directional Data Four Minus (BI_D4-)

Cable Testing for Existing Category 5 Cable

Installed Category 5 cabling must pass tests for Attenuation, Near-End Crosstalk (NEXT), and Far-End Crosstalk (FEXT). This cable testing information is specified in the ANSI/TIA/EIA-TSB-67 standard. Cables must also pass test parameters for Return Loss and Equal-Level Far-End Crosstalk (ELFEXT). These tests are specified in the ANSI/TIA/EIA-TSB-95 Bulletin, “The Additional Transmission Performance Guidelines for 100 Ohm 4-Pair Category 5 Cabling.”

Note that when testing your cable installation, be sure to include all patch cables between switches and end devices.

Adjusting Existing Category 5 Cabling to Run 1000BASE-T

If your existing Category 5 installation does not meet one of the test parameters for 1000BASE-T, there are basically three measures that can be applied to try to correct the problem:

1. Replace any Category 5 patch cables with high-performance Category 5e or Category 6 cables.
2. Reduce the number of connectors used in the link.
3. Reconnect some of the connectors in the link.

Fiber Standards

The current TIA (Telecommunications Industry Association) 568-A specification on optical fiber cabling consists of one recognized cable type for horizontal subsystems and two cable types for backbone subsystems.

Horizontal 62.5/125 micron multimode (two fibers per outlet).
Backbone 62.5/125 micron multimode or single-mode.

TIA 568-B will allow the use of 50/125 micron multimode optical fiber in both the horizontal and backbone in addition to the types listed above. All optical fiber components and installation practices must meet applicable building and safety codes.

Specifications

Specifications	
Physical Characteristics	
Ports	• 24 10/100BASE-TX, with auto-negotiation • 2 1000BASE-T/SFP combination ports
Network Interface	Ports 1-24: RJ-45 connector, auto MDI/X • 10BASE-T: RJ-45 (100-ohm, UTP cable; Categories 3 or better) • 100BASE-TX: RJ-45 (100-ohm, UTP cable; Category 5 or better) Ports 25, 26: RJ-45 connector, auto MDI/X • 1000BASE-T: RJ-45 (100-ohm, UTP cable; Category 5, 5e, or 6)
Buffer Architecture	8 Mbytes
Aggregate Bandwidth	8.8 Gbps
Switching Database	8K MAC address entries
Power-over-Ethernet	• Input voltage: - 48 V DC • Maximum output power per port: 15.4 W • Output Voltage: 44 - 57 V DC • Maximum output current per port: 350 mA DC
Power Supply	Internal, auto-ranging transformer: 100 to 240 V AC, 47 to 63 Hz
Power Consumption	• 48 Watts (Switching system) • 370 Watts (Power-over-Ethernet)
Maximum Current	• 3.8 A @ 110 V AC • 1.7 A @ 240 V AC
LEDs	• System: PWR, Diag, Stacking • Ports: Link/Act, PoE
Weight	5.76 kg (12 lbs 11 oz)
Size	44.0 x 41.0 x 4.3 cm (17.32 x 16.14 x 1.69 in.)
Temperature	• Operating: 0°C to 50°C (32°F to 122°F) • Storage: -40°C to 70°C (-40°F to 158°F)
Humidity	Operating: 5% to 95% (non-condensing)
Switch Features	
Forwarding Mode	Store-and-forward
Throughput	Wire speed
Flow Control	• Full Duplex: IEEE 802.3x • Half Duplex: Back pressure
Management Features	
In-Band Management	Telnet, SSH, or SNMP manager
Out-of-Band Management	RS-232 DB-9 console port
Software Loading	TFTP in-band, or XModem out-of-band

Specifications (Cont.)	
Standards	• IEEE 802.3 Ethernet • IEEE 802.3u Fast Ethernet • IEEE 802.3af Power-over-Ethernet • IEEE 802.3p priority tags • IEEE 802.3ac VLAN tagging • IEEE 802.1D Bridging • IEEE 802.3x full-duplex flow control • ISO/IEC 8802-3 Carrier sense multiple access with collision detection (CSMA/CD)
Compliances	
Emissions	• Industry Canada Class A • EN55022 (CISPR 22) Class A • EN 61000-3-2/3 • FCC Class A • VCCI Class A • C-Tick - AS/NZS 3548 (1995) Class A
Immunity	EN 61000-4-2/3/4/5/6/8/11
Safety	• CSA/CUS (CSA 22.2.950 & UL 1950) • EN60950 (TÜV/GS) • IEC 60950 (CB)

Glossary

10BASE-T

IEEE 802.3 specification for 10 Mbps Ethernet over two pairs of Category 3, 4, or 5 UTP cable.

1000BASE-SX

IEEE 802.3z specification for Gigabit Ethernet over two strands of 50/125 or 62.5/125 micron core fiber cable.

1000BASE-LH

Long range Gigabit Ethernet over two strands of 9/125 micron core fiber cable.

100BASE-TX

IEEE 802.3u specification for 100 Mbps Ethernet over two pairs of Category 5 UTP cable.

1000BASE-T

IEEE 802.3ab specification for Gigabit Ethernet over 100-ohm Category 5, 5e or 6 twisted-pair cable (using all four wire pairs).

Auto-Negotiation

Signalling method allowing each node to select its optimum operational mode (e.g., speed and duplex mode) based on the capabilities of the node to which it is connected.

Bandwidth

The difference between the highest and lowest frequencies available for network signals. Also synonymous with wire speed, the actual speed of the data transmission along the cable.

Collision

A condition in which packets transmitted over the cable interfere with each other. Their interference makes both signals unintelligible.

Collision Domain

Single CSMA/CD LAN segment.

CSMA/CD

CSMA/CD (Carrier Sense Multiple Access/Collision Detect) is the communication method employed by Ethernet, Fast Ethernet, and Gigabit Ethernet.

End Station

A workstation, server, or other device that does not forward traffic.

Ethernet

A network communication system developed and standardized by DEC, Intel, and Xerox, using baseband transmission, CSMA/CD access, logical bus topology, and coaxial cable. The successor IEEE 802.3 standard provides for integration into the OSI model and extends the physical layer and media with repeaters and implementations that operate on fiber, thin coax and twisted-pair cable.

Fast Ethernet

A 100 Mbps network communication system based on Ethernet and the CSMA/CD access method.

Gigabit Ethernet

A 1000 Mbps network communication system based on Ethernet and the CSMA/CD access method.

Full Duplex

Transmission method that allows two network devices to transmit and receive concurrently, effectively doubling the bandwidth of that link.

IEEE

Institute of Electrical and Electronic Engineers.

IEEE 802.3

Defines carrier sense multiple access with collision detection (CSMA/CD) access method and physical layer specifications.

IEEE 802.3ab

Defines CSMA/CD access method and physical layer specifications for 1000BASE-T Gigabit Ethernet.

IEEE 802.3u

Defines CSMA/CD access method and physical layer specifications for 100BASE-TX Fast Ethernet.

IEEE 802.3x

Defines Ethernet frame start/stop requests and timers used for flow control on full-duplex links.

IEEE 802.3z

Defines CSMA/CD access method and physical layer specifications for 1000BASE Gigabit Ethernet.

LAN Segment

Separate LAN or collision domain.

LED

Light emitting diode used for monitoring a device or network condition.

Local Area Network (LAN)

A group of interconnected computer and support devices.

Modal Bandwidth

Bandwidth for multimode fiber is referred to as modal bandwidth because it varies with the modal field (or core diameter) of the fiber. Modal bandwidth is specified in units of MHz per km, which indicates the amount of bandwidth supported by the fiber for a one km distance.

Media Access Control (MAC)

A portion of the networking protocol that governs access to the transmission medium, facilitating the exchange of data between network nodes.

MIB

An acronym for Management Information Base. It is a set of database objects that contains information about the device.

Network Diameter

Wire distance between two end stations in the same collision domain.

RJ-45 Connector

A connector for twisted-pair wiring.

Switched Ports

Ports that are on separate collision domains or LAN segments.

TIA

Telecommunications Industry Association

Transmission Control Protocol/Internet Protocol (TCP/IP)

Protocol suite that includes TCP as the primary transport protocol, and IP as the network layer protocol.

UTP

Unshielded twisted-pair cable.

Virtual LAN (VLAN)

A Virtual LAN is a collection of network nodes that share the same collision domain regardless of their physical location or connection point in the network. A VLAN serves as a logical workgroup with no physical barriers, allowing users to share information and resources as though located on the same LAN.

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